Remarks and Arguments

Claims 2-7 remain pending in this application. No claims have been added, cancelled or amended.

Rejections under 35 U.S.C. § 103

Claims 2-7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,929,836 ("Kikuchi") in view of U.S. Patent No. 5,656,719 ("Stibal"). The Examiner alleges that Kikuchi teaches a method of compression molding involving extruding a polyester resin, cutting the resin into portions, and transporting the resulting resin lump to a compression molding device. The Examiner admits that Kikuchi does not disclose a continuous process and turns to Stibal for allegedly teaching a method of making preforms by continuously flowing a polyethylene terephthalate melt from a post-condensation reactor into a molding tool, which may be for injection molding, fiber spinning, or an extruder.

In the Advisory Action, the Examiner further asserts that one skilled in the art would have a "strong motivation to perform any required modifications in the manufacturing line in order to avoid the presence of acetaldehydes."

Applicants respectfully traverse this rejection. The Examiner makes the error in assuming that Kikuchi's compression molding process having different components and conditions would result in a similarly high acetaldehyde content as that of prior art injection molding processes, thereby requiring the solution provided by Stibal. There is insufficient data to conclude that Kikuchi's compression molding process would result in unacceptably high acetaldehyde values that would merit making significant changes to the manufacturing process. If anything, Stibal teaches away from the Examiner's erroneous assumption and oversimplification by showing that numerous factors contribute to the final acetaldehyde content. One skilled in the art could only conclude that Stibal teaches reducing acetaldehyde content from conventional injection molding processes only and would not have concluded that Stibal's modifications would result in a similarly reduced acetaldehyde content for Kikuchi's compression molding, assuming that Kikuchi even had unacceptable acetaldehyde values.

Stibal focuses on the technical problem of reducing the acetaldehyde content of polyester bottles. (Stibal at col. 1, ll. 23-25.) In the Background section, Stibal describes the conventional injection molding process as taking solid-phased, post-condensed polyester granules melted in the extruder of an injection molding machine and pressed into the cavities of the injection molding tool. (*Id.* at col. 2, ll. 20-25.) When polyester granules are "<u>melted in an injection molding extruder</u>," the acetaldehyde content increases due to shear and high temperatures. (*Id.* at col. 2, lines 34-39.) Even with optimally adjusted extruders and injection molding units, the acetaldehyde formation increases by 5 ppm. (*Id.* at col. 2, ll. 38-43.)

According to Stibal, it was "surprisingly noted" that bypassing the granule stage leads to reduced acetaldehyde. (*Id.* at col. 4, ll. 29-42.) Stibal thus proposes to solve the problem by using a condensation injection molding process from a polyethylene terephthalate melt and/or its copolyesters having a reduced acetaldehyde content under vacuum at elevated temperatures in a melt post-condensation reactor, followed by immediately guiding the melt to an injection molding tool for manufacturing the performs, i.e., an "in-line" process. (*Id.* at col. 3, ll. 32-45 and 58-62.) Stibal states that this process leads to less acetaldehyde formation in comparison to present day process "because of the omission of the re-melting process with its intensive shearing action," due to eliminating the use of granules (*Id.* at col. 6, lines 5-8.)

Stibal's data and detailed explanations educate one skilled in the art on the complexities of reducing acetaldehyde content. FIG. 1 of Stibal describes the system of FIG. 1, including:

1	a polyester melt flow;
2	optionally an inert gas flow
3	a continuously operating screw post-condensation reactor for increasing the intrinsic viscosity;
4	a vacuum system for the removal of volatile reaction products;
5	a melt flow of bottle intrinsic viscosity and low acetaldehyde content;
6	a device for continuous removal of the melt flow and charging the injection molding tool, e.g., a double piston system;

7 an injection molding tool; and

8 removal of bottle preforms with acetaldehyde content of less than 10 ppm.

(*Id.* at col. 4, l. 50 to col. 5, l. 7.)

Factors that affect acetaldehyde content include:

- optimal value of selected screw rpm of melt reactor **1** (*id.* at col. 5, ll. 52-53);
- optimal residence time of the melt in the reactor (*id.* at col. 5, ll. 53-55); and
- melt temperature and intrinsic viscosity, where a high temperature is better for viscosity generation but a low temperature is better for low acetaldehyde content (*id.* at col. 5, ll. 57-63).

Table 1 of Stibal provides additional evidence of this complexity. Each of the products in the Examples of Table 1 were subjected to a post-condensation melt reactor prepared from granules having an intrinsic viscosity of 0.647 (*id.* at col. 7, ll. 25-47). Depending on the screw rpm, final intrinsic viscosity, melt temperature, and residence time, the acetaldehyde content can be reduced from an unacceptable value of 31 ppm (Example 1, screw rpm of 8, i.v. of 0.758, residence time = 33, melt temperature of 283°C) to 12 ppm (Example 2, screw rpm of 12, i.v. of 0.783 keeping all other factors the same as Example 1). In another comparison, Example 3 with a screw rpm of 8, i.v. of 0.837 and residence time of 52 gives a similar acetaldehyde content (11 ppm) as Example 2. The acetaldehyde content can be reduced even further to a value as low as 4.0 ppm (Example 6) by increasing the screw rpm to 18 with an intrinsic viscosity at 0.758, lower melt temperature of 265°C compared to Example 1. These Examples illustrate the need to compare and control each of these parameters to achieve acceptable acetaldehyde values.

In a different set of experiments, Examples 17-21 of Stibal provide a series of tests performed on granules melted in a multi-screw extruder (different from the post-condensation melt reactor of Examples 1-16) with the option of supplying an inert gas. (*Id.* at col. 8, ll. 44-45 and Table 2.) According to Table 2, the acetaldehyde content can be reduced by controlling the nitrogen flow directed towards a melt produced from CoPET granules having an i.v. of 0.581 prior to entering the extruder reactor. (*Id.* at col. 8, ll. 52-58.) However, in this situation, increasing the screw rpm leads to increased

acetaldehyde content whereas in Examples 1-16, the screw rpm was generally increased to reduce acetaldehyde content.

These examples of Stibal shows the numerous factors that can affect the acetaldehyde content including reactor type, option of introducing an inert gas, melt temperature, intrinsic viscosity, type of resin, residence time in the extruder/reactor, and screw rpm. These factors are not spelled out in the compression molding process of Kikuchi.

The compression molding process of Kikuchi involves supplying a resin for inner and outer layers from a main extruder. (Kikuchi at col. 7, ll. 63-66.) After merging with another resin extruded from another nozzle, this resin remains in a molten state when transported to a cutting component and cut to a given size. (*Id.* at col. 8, ll. 1-9.) After cutting, the resin remains as a molten resin lump and transported to a compression molding device where it is molded into the multilayered perform. (*Id.* at col. 8, ll. 9-18.) In a specific example, Kikuchi supplies PET having an intrinsic viscosity of 0.75 dl/g and combined with a polyamide melt as an intermediate layer. (*Id.* at col. 9, ll. 34-38.) The residence time in the extruder is not known. However, because the melt remains in a molten state even after leaving the extruder and throughout the cutting process, the additional time spent in the molten state could effectively increase the "residence time" of the polymer in a molten state and contribute to lower acetaldehyde content – thus, one skilled in the art could have concluded that the different transport times between injection molding and compression molding systems would affect acetaldehyde content. Indeed, it is possible that Kikuchi's compression molding system that allows the resin to remain in molten state after leaving the extruder, coupled with the initial i.v. of Kikuchi's resin, which is higher than that of Stibal's resins, (the melt temperature is unknown) could result in an inherently reduced acetaldehyde content compared to conventional injection molding systems.

At the very least, the Examiner is incorrect in concluding that one would have been motivated to modify the compression molding system of Kikuchi based on Stibal's teachings of injection molding systems (using different components) and different

manufacturing conditions, particularly when it is unknown that the acetaldehyde content of Kikuchi's bottles are unacceptable.

Moreover, it appears that the Examiner believes that changing manufacturing lines is a simple process that would be adopted with little consequence. Applicants respectfully submit that exchanging the compression mold of Kikuchi into the continuous in-line process is not a simple matter of replacing one mold for the other. The skilled person would not have simply applied the continuous process of Stibal to the compression molding process of Kikuchi. Such a change would result in significant changes in the manufacturing line because injection molding is an intermittent process requiring precise timing of delivering the resin to the mold under high pressure. As a result, both molds require very different components. As discussed previously, Stibal describes the following stages/devices for its system, including a continuously operating screw post-condensation reactor for increasing the intrinsic viscosity, a vacuum system for the removal of volatile reaction products, a device for continuous removal of the melt flow and charging the injection molding tool, e.g., a double piston system, and an injection molding tool. (Stibal at col. 4, line 50 to col. 5, line 7.) To reconcile the intermittent process of injection molding with a continuous melt flow, Stibal incorporates a "double piston" device to allow one piston to fill while the other is firing. Because Kikuchi uses a compression molding system that is not intermittent, Kikuchi would need different components not taught by Stibal.

In conclusion, the Examiner has not shown any clear deficiency in the system of Kikuchi, namely that it would produce bottles having an unacceptable acetaldehyde content, that would require the modification taught by Stibal. Applicants respectfully submit that one skilled in the art would not be motivated to make significant changes to Kikuchi's manufacturing process, as taught by Stibal, based on insufficient acetaldehyde data of Kikuchi's resins. Accordingly, a a *prima facie* case of obviousness has not been established in view of Kikuchi and Stibal and Applicants request withdrawal of these rejections.

RECONSIDERATION

It is believed that all claims of the present application are now in condition for allowance.

Reconsideration of this application is respectfully requested. If the Examiner believes that a teleconference would expedite prosecution of the present application the Examiner is invited to call the Applicants' undersigned attorney at the Examiner's earliest convenience.

Any amendments or cancellation or submissions with respect to the claims herein is made without prejudice and is not an admission that said canceled or amended or otherwise affected subject matter is not patentable. Applicants reserve the right to pursue canceled or amended subject matter in one or more continuation, divisional or continuation-in-part applications.

To the extent that Applicants have not addressed one or more assertions of the Examiner because the foregoing response is sufficient, this is not an admission by Applicants as to the accuracy of such assertions.

Please grant any extensions of time required to enter this response and charge any fees in addition to fees submitted herewith that may be required to enter/allow this response and any accompanying papers to our deposit account 02-3038 and credit any overpayments thereto.

Respectfully submitted,

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